

Onions



- Onions (2006)
- Onions (2007)
- Onions – Soil and Foliar Fertility (2008)
- Soil based and foliar fertility product comparison for enhancing yellow onion production (2009)

Experiment: Onions

Year (Experiment Number): 2006 (06-207)

Date of Planting/Harvest: Apr 19 / Sept 10

Hybrid: Millennium

Plot Size (replications): 10' x 2.5', 4 reps

Soil Test Levels (ppm)

pH ~ 7.3 P1 ~ 61

CEC ~ 6.3 K ~ 87

OM ~ 1.8% (3.5% K)

The objective of this trial was to utilize various Agro-Culture Liquid Fertilizer programs to enhance onion size and yields.

Onions are a crop which can be grown from seeds as well as transplanted from onion sets. In both cases, establishment and early season development are important to the yield and quality of the onions produced. Inputs of phosphorus and potassium are commonly made prior to planting and nitrogen is very often applied as split applications during the growing season. Sure-K application timings and the use of eNhance[®] to stabilize 28% UAN were some of the treatments. Comparisons with conventional dry fertilizer products were also made.



- “Millennium” variety onions were planted into the research plots on April 19, 2006. Each plot was 10' x 2.5' and consisted of two paired rows with a 4" spacing between rows.
- The entire plot area received the equivalent of 20 tons/Acre of dairy manure prior to being plowed to a depth of 6" during fall tillage. In the spring, a tractor mounted rotor-tiller was used to prepare the plots for planting.
- Granular fertilizers for the conventional dry fertilizer treatment were broadcast across selected plots and lightly incorporated into the soil prior to planting. Solutions containing the described Agro-Culture Liquid Fertilizers or the conventional liquid fertilizer treatment were applied using a fertilizer knife that placed the treatments 2" below each row of the plot. Two sidedress fertilizer applications were made. The initial treatment was on June 13th and second on June 20th to the north and south sides of the double row, respectively.
- Stand counts for each plot were taken on June 28th to quantify the relative differences in plant populations and spacing.
- Foliar fertilizer applications were made at bulb swell (~1.25" diameter) on June 28th and then a second application of the same treatments was made on July 7th. All foliar applications were made with a backpack sprayer and hand boom equipped with flat fan nozzles. These fertilizer mixtures were diluted with water and applied at a total volume of 15 gallons per acre. Fungicides and insecticides were applied separately, but in a similar manner as needed throughout the season.
- PTS in treatment #5 is Protristim, a protein cell carrier with a tri-alcohol growth stimulant that boosts the ability to store energy for the photosynthetic process.
- The onions were lifted by hand on September 10, 2006 and the tops were allowed to cure for 10 days prior to harvest. On September 20th the tops were cut by hand, the onions were collected, sorted according to size, then counted and weighed by size category.

Table O1. Fertility Programs Utilized for Onion Production, 2006.

	Treatment	Rate/A	Method of Application
1	High NRG-N + Pro-Germ + SK + Micro 500 + Mn High NRG-N	5 + 7 + 16 + 1 qt + 1 qt 14 & 14	Band over row Side dress #1 & #2
2	High NRG-N + Pro-Germ + SK + Micro 500 + Mn High NRG-N	5 + 7 + 16 + 1 qt + 1 qt 14 & 14	2" below seed Side dress #1 & #2
3	High NRG-N + Pro-Germ + SK + Micro 500 + Mn High NRG-N SK	5 + 7 + 10 + 1 qt + 1 qt 14 & 14 3 x 2	2" below seed Side dress #1 & #2 Foliar #1 & #2
4	High NRG-N + Pro-Germ + SK + Micro 500 + Mn High NRG-N SK + PTS	5 + 7 + 10 + 1 qt + 1 qt 14 (3 + 2 oz) x 2	2" below seed Side dress #1 & #2 Foliar #1 & #2
5	High NRG-N + Pro-Germ + SK + Micro 500 + Mn High NRG-N + SK High NRG-N	5 + 7 + 10 + 1 qt + 1 qt 14 + 6 14	2" below seed Side dress #1 Side dress #2
6	eN + Pro-Germ + SK + Micro 500 + Mn 28% + eNhance	6.67 + 7 + 16 + 1 qt + 1 qt 18.76	2" below seed Top Dress #1 & #2
7	Potash 18-46-0 Mn-Sulfate (4# Mn) Urea	350 lbs 200 lbs 15 lbs 150 lbs + 150 lbs.	broadcast 2" below seed 2" below seed Top Dress #1 & #2

RESULTS:

- Onions that received applications of Agro-Culture Liquid Fertilizer products at planting followed by a side dress treatments of High NRG-N and Sure-K (treatment #5) had the highest yield. Additionally, just over one-third of all the onions produced in this treatment were graded as jumbos or larger.
- The onion yields for the fertility programs receiving foliar treatments (trt. 3&4) out-yielded similar treatments where all the fertility was applied early season as pre-plant and sidedress applications (trt. 1 & 2).
- Following planting, soil conditions were very wet and cool and the establishment of the onions in portions of many plots was poor. While onion yields from these small plot trials were highly dependent the plant population and variability in the onion populations reduced the total onion yields for this trial. The observed population differences were not statistically significant for total yield or onion sizing in this trial. Total yields for all treatments were statistically similar.
- The utilization of 28% UAN that was stabilized with eNhance® (Trt. 6) was among the top yielding fertility programs in this trial. The onion sizing and yield shows that sufficient nitrogen was provided to these onions, despite lower fertilizer application rates than the urea that was utilized for the conventional fertility program.
- Fertility programs significantly impacted the percentage of Jumbo and larger onions produced in this trial. Treatments 1, 2, & 4 had significantly fewer Jumbo sized onions than the remaining treatments. While the yield of Jumbo sized onions for the conventional fertility was similar to the three remaining fertility programs (treatments 3, 5, &6) the yield of boiler and medium grade onions was the lowest observed for any individual fertility program. On a percentage basis, the grade distribution for the conventional fertilizer would look good, but because of the lower total yields the actual profitability would be low.
- The addition of Sure-K to the sidedress nitrogen application and the use of eNhance with standard UAN fertilizers both offered enhanced yield and sizing of the onions.

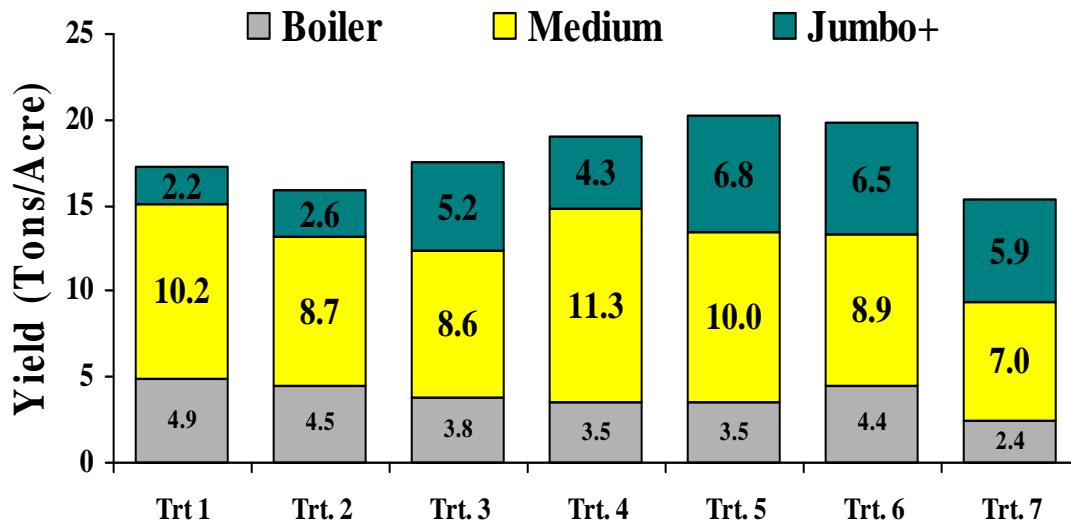


Figure O1. Effect of fertility programs on the yields and size distribution of onions.

Table O2. Onion yield by grade and total for various fertility programs.

Treatment	Boilers	Medium	Jumbo	Total
	Tons Per Acre			
1	4.9	10.2	2.2	17.3
2	4.5	8.7	2.6	15.9
3	3.8	8.6	5.2	17.6
4	3.5	11.3	4.3	19.1
5	3.5	10.0	6.8	20.3
6	4.4	8.9	6.5	19.9
7	2.4	7.0	5.9	15.3

Conclusions:

Onions responded very well to the use of eNhance® with the 28% UAN as a method to stabilize the nitrogen supply through-out the entire growing season. Sure-K applied in the soil performed better than foliar treatments of this product this year.

Conventional fertilizers were applied according to published guidelines from Michigan State University's Nutrient Recommendations for Vegetable Crops in Michigan. Ext Bulletin E2934, 2004



Experiment: Onions**Year (Experiment Number):** 2007 (07-201)**Date of Planting/Harvest:** Apr 19 / Sept 10**Hybrid:** Millennium**Plot Size (replications):** 15' x 2.5', 3 reps**Soil Test Levels (ppm)**

pH ~ 7.3 P1 ~ 61

CEC ~ 6.3 K ~ 87

OM ~ 1.8% (3.5% K)

Onions are a crop which can be grown from seeds as well as transplanted from onion sets. In both cases, establishment and early season development are important to the yield and quality of the onions produced. Inputs of phosphorus and potassium are commonly made prior to planting and nitrogen is very often applied as split applications during the growing season. This trial followed that idea and utilized various Agro-Culture Liquid Fertilizer programs to enhance onion size and yields. Foliar fertilizer applications and the use of eNhance® to stabilize 28% UAN were some of the treatments. Comparisons with conventional dry fertilizer products were also made.



- The entire plot area received the equivalent of 20 tons/Acre of dairy manure prior to being plowed to a depth of 6" during fall tillage. In the spring, a tractor mounted rotor-tiller was used to prepare the plots for planting. A yield goal of 12 tons/acre along with Michigan State University's Vegetable Fertility Guide (E2934) was used as the basis for fertility levels.

Table O1. Fertility programs evaluated in 2007 for enhancement of onion yields.

Treatment (Yield goal = 20 tons/Acre)		Rate/A (gal/A)	Method of Application
1	Untreated Control	0	na
2	0-0-60+18-46-0+Zn 28% UAN (Conventional Fertilizers)	121, 79, 3.7# 20.2 x 2	PPI/broadcast SD
3	PG + SK + Micro 500 High NRG-N	6, 9.3, 1 qt 15 x 2	PP band SD
4	PG + SK + Micro 500 28% w/ eNhance (80% rate)	6, 9.3, 1 qt 19.6 x 2	PP band SD
5	PG + SK + Micro 500 High NRG-N Sure K + Nut. Foliar + PTS	6, 7.3, 1 qt 15 x 2 2+1+2oz	PP band SD Foliar*
6	PG + SK + Micro 500 High NRG-N Sure K + G07	6, 7.3, 1 qt 15 x 2 2+1+2 qt.	PP band SD Foliar*
7	PG + SK + Micro 500 High NRG-N Green and Grow Write Professional	6, 9.3, 1 qt 15 x 2 2 qt	PP band SD Foliar*
8	PG + SK + Micro 500 High NRG-N Woody Plants and Trees	6, 9.3, 1 qt 15 x 2 2 qt	PP band SD Foliar*

SK = Sure-K, PG=Pro-Germinator, HN = High HRG-N, NR = High HRG-NR,

- The dry fertilizers were broadcast then lightly incorporated, liquid fertilizer materials were banded on the soil surface in two separate bands slightly off-center of selected plot areas and then all plots were formed into beds (4" tall x 24" wide). Forming the bed placed the liquid fertilizers approximately 3"-4" below the top of this bed. "Millennium" variety onions were High-Performance Proof

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planted onto the beds directly over the banded fertilizer applications on April 24th, 2007. Each plot was 15' x 2.5' and consisted of two x paired rows with 8-10" spacing between rows and a 4" spacing between pairs – 4 rows per plot.

- Two side dress nitrogen applications were made during the growing season to the center of the bed for each plot area. The initial treatment was on June 15th and second on June 29th.
- Foliar fertilizer applications were made at bulb swell (~1.25" diameter) on July 2nd and again three weeks later on July 24th. All foliar applications were made with a backpack sprayer and hand boom equipped with flat fan nozzles. These fertilizer mixtures were diluted with water and applied at a total volume of 15 gallons per acre. A surfactant was not included with any fertilizer application. Fungicides and insecticides were applied separate from the fertilizers with an air-blast backpack sprayer as needed throughout the season.
- The onions were lifted by hand on September 10, 2007 and the tops were allowed to cure for about 10 days prior to harvest. On September 21th the tops were cut by hand, the onions were collected, sorted according to USDA grade standards and then weighed by category.

RESULTS:

- Onion yields were much higher than expected for the untreated control plots. This may be due to the application of 20 ton/ A of dairy manure to the plot area in the fall prior to this trial.
- The Agro Culture Liquid Fertilizer base fertilizer program with side dress applications of High NRG-N[®] (Trt #3) produced the greatest yield of Jumbo sized onions (Chart O1) of any fertility program in this trial, a 33% increase above the conventional program. The yield of medium grade onions was enhanced slightly and the quantity of boiler grade onions was reduced. Because of the increase in the yield of jumbo and medium grades the total yield/value was near the highest for all fertility programs in this trial.
- The four foliar fertilizer application programs didn't produce any significant change in total yield or grade distribution compared to the other fertility programs this past season. The foliar applications were made without any surfactants. Last season the foliar fertilizer applications showed positive responses for onion yield and grade. The growing conditions this season was warmer and dryer at the time of application and dryer so a surfactant would have likely benefited these applications on the waxy leaf surface of the onions.

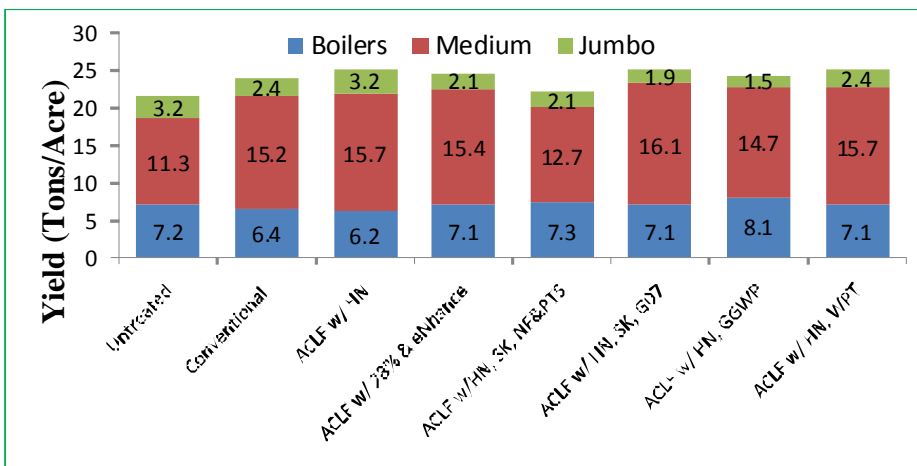
Table O2. Onion yield by grade and total for various fertility programs.

Treatment	Boilers	Medium	Jumbo	Total
	Tons Per Acre			
1	7.2	11.3	3.2	21.7
2	6.4	15.2*	2.4	24.0
3	6.2	15.7*	3.2	25.1
4	7.1	15.4*	2.1	24.6
5	7.3	12.7	2.1	22.1
6	7.1	16.1*	1.9	25.1
7	8.1	14.7*	1.5	24.3
8	7.1	15.7*	2.4	25.2

*Treatments are statistically different from the Untreated Control according to Duncan's Multiple Range Test (P<0.10)

- The ACLF programs with High NRG-N resulted in the greatest yield of medium grade and larger onions.
- There were statistical differences between yield of medium grade onions for the untreated control and all treatments except #5. However all fertility programs were statistically similar for total yield, boiler and jumbo grade category onions. In general terms, adding fertility improved total onion yields, specifically in the medium grade category. However, statistically there was not a significant difference for any grade category or total yield among the fertility programs evaluated.

- Larger plots and greater replication will be utilized in 2008 to minimize plot-to-plot variation and hopefully achieve statistical significance between treatment programs. Additionally, surfactants will be used with the foliar applications to promote greater uptake of the foliar treatments.



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Chart O1. Effect of fertility programs on the yields and size distribution of onions.



Example of some onion types grown in Michigan

Experiment: Onions – Soil and Foliar Fertility
Year (Experiment Number): 2008 (08-201)
Date of Planting/Harvest: Apr 19 / Sept 10
Hybrid: Millennium
Plot Size (replications): 15' x 2.5', 3 reps

<u>Soil Test Levels (ppm)</u>	
pH ~ 7.3	P1 ~ 61
CEC ~ 6.3	K ~ 87
OM ~ 1.8%	(3.5% K)

Onions are a crop which establishment and early season development are important to the yield and quality of the onions produced. Inputs of phosphorus and potassium are commonly made prior to planting and nitrogen is very often applied as split applications during the growing season. This trial followed that idea and utilized various Agro-Culture Liquid Fertilizer programs to enhance onion size and yields. Comparisons with conventional dry fertilizer products were also made.



- The entire plot area was in vegetable plots in the season prior to this trial. The residue was plowed to a depth of 6" during fall tillage. In the spring, a tractor mounted rotor-tiller was used to prepare the plots for planting. A yield goal of 25 tons/acre along with Michigan State University's Vegetable Fertility Guide (E2934) was used as the basis for fertility levels. The base N: P₂O₅: K₂O rates used for all plots were 190, 79 and 140 pounds per acre respectively.

Table O1. Fertility programs evaluated in 2008 for enhancement of onion yields.

Treatment	Rate/A (gal/A)	Method of Application
1 Untreated Control	0	na
2 0-0-60+18-46-0 + Mn+Zn 28% UAN	234+171 + 4# +4# 28 x 2	Broadcast/PPI SD
3 PG + SK + Micro 500 HN	6 + 10.8 + 3 qt 19 x 2	PP band SD
4 PG + SK + Micro 500 28% w/ eNhanche	6 + 10.8 + 3 qt 22.5 x 2	PP band SD
5 PGK + SK + Micro 500 HN	6 + 10.8 + 3 qt 19 x 2	PP band SD
6 PG + SK + Micro 500 HN F-07	6 + 10.8 + 3 qt 19 x 2 3	PP band SD Foliar*
7 PG + SK + Micro 500 HN Sure-K + G-07	6 + 10.8 + 3 qt 19 x 2 2 + 2 qt	PP band SD Foliar*
8 PG + SK + Micro 500 HN Sure K + Nut. Foliar + PTS	6 + 10.8 + 3 qt 19 x 2 2+1+2oz	PP band SD Foliar*
9 PG + SK + Micro 500 (2x7" band) HN	6 + 10.8 + 3 qt 19 x 2	Surface band SD
10 PG + SK + Micro 500 (2x7" band) HN + PG + SK+ Micro-500	3.5 + 6 + 2 qt (19+1.5+2+1pt)x 2	Surface band SD
11 PG + SK + Micro 500 (1x24" band) HN	6 +10.8 + 3 qt 19 x 2	Surface band SD

SK = Sure-K™, PG=Pro-Germinator™, HN = High NRG-N™, G07 & F07 were Experimental Foliar Materials. PGK was an alternative formulation of Pro-Germinator evaluated this season. Nut. Foliar = Nutritional Foliar (4-1-2), PTS=Protristim

- The dry fertilizers were broadcast then lightly incorporated with a rake, liquid fertilizer materials were banded prior to planting (PP Band) on the soil surface in two separate bands slightly off-center of selected plot areas and then all plots were formed into beds (4" tall x 24" wide).

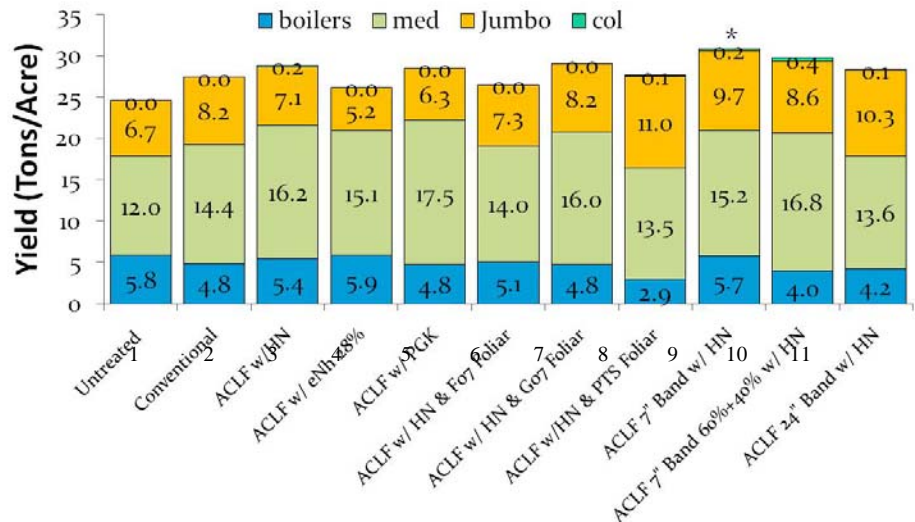
Forming the bed placed the liquid fertilizers approximately 3"-4" below the top of this bed. "Millennium" variety onions were planted with a double row Grammore machine push planter. Each double row was placed approximately over the banded fertilizer applications on April 24th, 2008. Every plot was 20' x 2.5' and consisted of two paired rows with 8-10" spacing between rows and a 4" spacing within pairs – 4 rows per plot.

- Two side dress nitrogen applications were made directly on the soil surface during the growing season to the center of the bed for each plot area, between the two sets of double rows. The initial treatment was on June 15th and second on June 29th. Following each application, irrigation was utilized to incorporate the nitrogen applications.
- Foliar fertilizer applications were made at bulb swell (~1.25" diameter) on July 2nd and again four weeks later on Aug 4th. All foliar applications were made with a backpack sprayer and hand boom equipped with flat fan nozzles. These fertilizer mixtures were diluted with water and applied at a total volume of 15 gallons per acre. Fungicides and insecticides were applied separate from the fertilizers with an air-blast backpack sprayer as needed throughout the growing season.
- The onions were lifted on September 18th and the tops were allowed to cure for about 10 days prior to harvest. On September 30th the tops were cut by hand, the onions were collected, sorted according to USDA grade standards and then weighed by category.

RESULTS:

- This trial had several treatments and objectives for fertilizer comparisons. The first three treatments are to be used as the standards for comparison for most of these fertility programs (Figure O1).
- The yield for the untreated control was exceptionally high, yielding 24.6 tons per acre this year. Conventional fertilizer program (Trt. #2) produced nearly 3 tons more onions than the untreated control, 27.4 tons per acre. The ACLF base fertility program was among one of the highest yielding treatment programs with a yield of 28.8 tons per acre. Additionally, this treatment had a small portion of colossal sized onions, they were not found in any of the previously mentioned treatments.

- The use of eNanced 28% UAN instead of High NRG-N in Trt. #4 resulted in slightly lower yields of onions than the ACLF Base application. However, yields were very similar in the two smaller grade categories.
- The use of PGK with the other ACLF products didn't change the yield or grade distribution



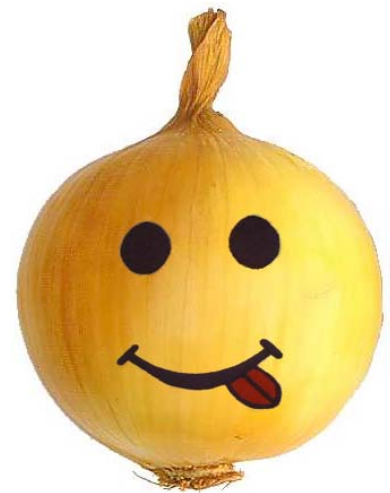
*Significantly different from Untreated control for total yield - Duncan's MRT P ≤ 0.10

Figure O1. Onion Yields by Marketable Grade from Various Fertility Programs in 2008
 The performance of this experimental formulation was nearly identical to Pro-Germinator in this trial. However, no colossal sized onions were produced with this fertility program.

- Foliar fertilizer treatments were added to the ACLF Base program in the next three treatments (Trt. 6-8) of this trial. Among these three treatments, the most notable was treatment #8, the PTS foliar. This treatment program had the highest yield of Jumbo sized onions as well as some colossal sized onions. Comparison with the ACLF base shows nearly a four ton increase in the Jumbo grade category.
- In the remaining three fertility programs, the only difference between them and the ACLF base program is the fertilizer placement. For the ACLF Base program, the Pro-Germinator, Sure-K and Micro-500 were placed in a band below the seed row. For these treatments, all or part of the fertilizers was banded on the soil surface after planting. Treatment #9 had 100% of the Pro-Germinator, Sure-K and Micro-500 placed in a 7" band applied directly over each paired row in the plot (2 x 7"). The application rate of the Pro-Germinator and Sure-K was reduced to only 60% in the same 7" bands for treatment #10. Again 100% of these products were used in Treatment # 11, but in this case a single 24" band was utilized to band these fertilizers across the top of the entire bed. All three of these treatments results in the production of colossal sized onions as well as some of the highest yields in this trial. The greatest yield among these treatments and in the entire trial was from treatment #8, 100% of the fertility in a narrow (7") band over the seed row at planting. This likely kept the fertility close to the seed for early season plant development and growth without harming plant stands. The fertilizer likely was moved into the soil by rain and irrigation water as no tillage was used which would hve incorporated the materials. Additionally, this treatment had significantly greater total yield than the untreated control. Applying only 60% of the total P & K at planting in a narrow band (Trt #10) and the remainder with the side dress applications was very similar for total yield, but produced more colossal sized onions than the 100% application. The wide band containing 100% of these nutrients had a slightly lower yield for jumbo sized onions, but total yield was similar to the two other surface banded applications.

Conclusions

- Banding the ACLF Fertilizers narrowly on the surface of the soil following planting was as effective method of fertilizer placement for onion production. Yields were positively impacted, mostly in the larger sized onions were produced, from this type of application method.
- The use of ACLF fertilizer programs generally resulted in more Jumbo sized onions and the presence of Colossal sized onions. The conventional fertilizer program utilized for this trial produced no colossal sized onions.
- Foliar applications of PTS resulted in the greatest yield of Jumbo and larger sized onions in this trial.



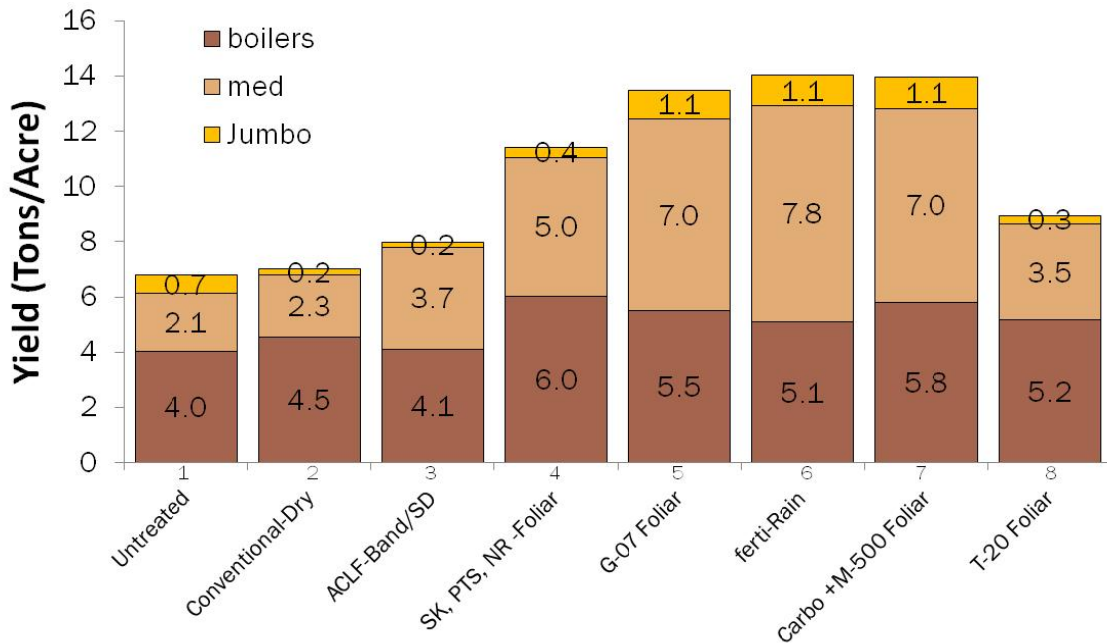


Experiment 09-201: Soil based and foliar fertility product comparisons for enhancing yellow onion production, 2009.

Planted: 5/29/09	Variety: Millennium	Population: 1" in-row
Plot Size: 2-double rows x 20'	Reps: 3	Harvested: 10/4
Side dress: 7/9, 7/25	Foliar: Bulb swell 8/14	Foliar: 9/10

Soil Test Values (ppm):													
pH	CEC	% OM	P1	K	S	% K	% Mg	% Ca	% H	% Na	Zn	Mn	B
7.3	6.5	1.4	69	84	11	3.3	19.1	76.7	-	0.9	1.7	11	0.6

Objectives: Determine that potential for late season foliar applications to impact the yield and size of yellow onions. Basic fertility comparisons of ACLF Products with conventional fertilizers for yield and quality of onions.



Conclusions:

- Overall yield were generally poor and sizing was very limited this year. Poor initial plant stands required replanting the onions in late May. This delay and the cool growing conditions experienced during the 2009 growing season significantly reduced the yield potential and also sizing of these onions. All yields were well below fertility yield goals.
- Both base fertility programs (Trt. 2 & 3) offered only limited yield enhancement compare to the untreated control. Comparatively, the ACLF Base program did show a modest shift from the boiler grade up into the medium sized onions.
- Foliar fertilizer applications (Trt. 4-8) showed modest to relatively dramatic yield improvement over the base treatment (Trt. 3) to which they were applied. Three treatments were clear stand-outs for yield and sizing, Trt. 5-7. The use of ferti-Rain provided the best overall yield and best size distribution among these top treatments. However, the use of Carbo with Micro-500 and the experimental foliar G-07 also provided similar yields in each of the three grade categories to which the yields were divided. Yields for these three foliars were nearly double that of the base treatment. Such yield increases would not be as likely with more typical planting and growing conditions, still they were impressive.

*See Product Descriptions in the introduction for more information on ACLF products used.

Table O1. Base fertilizer and foliar fertility program comparisons for onion productions, 2009.

	Treatment	Rate/A (gal/A)	Method of Application
1	Untreated Control	0	na
2	0-0-60+18-46-0 + Mn + Zn 28% UAN	244, 171, 7#,4# 33 x 2	Broadcast/PPI Side dress
3	PG + SK + Micro 500 HN	8, 12, 3.8 qt 20 x 2	Planter band Side dress
4	PG + SK + Micro 500 HN PTS + H-NR + Sure-K	8, 12, 3.8 qt 20 x 2 2 qt +1 qt + 2	Broadcast/PPI Surface Band SD
5	PG + SK + Micro 500 HN G-07 + Sure-K	8, 12, 3.8 qt 20 x 2 2 qt + 2	Planter band Side Dress Foliar*
6	PG + SK + Micro 500 HN ferti-Rain	8, 12, 3.8 qt 20 x 2 3	Planter band Side Dress Foliar*
7	PG + SK + Micro 500 HN Carbo + M-500 + Sure-K	8, 12, 3.8 qt 20 x 2 1 pt + 1 pt + 2	Planter band Side Dress Foliar*
8	PG + SK + Micro 500 HN Plant Products 20-20-20	8, 12, 3.8 qt 20 x 2 5 lb	Planter band Side Dress Foliar*

The plot was originally established and planted on April 24th, 2009 using new planter that allowed for more precise placement of the starter fertilizers relative to the seed row. However, by mid-May the plant stands were still very limited in all plots. Therefore, on May 29th the entire plot area was treated with Roundup herbicide at 1 qt./Acre to kill all emerged weeds and onions. Then, without any tillage to moved or diluted the fertilizer bands, each plot was replanted over the existing rows with the old double-row push planter specially designed for onion planting. Onions from this planting emerged well after planting, but in addition to being late planted they were still slow to develop with the below average temperatures experienced in 2009. In July, two side dress nitrogen applications were made to each plot as described in the above table. During the course of the growing season, irrigation, herbicide, fungicides and insecticides were each applied uniformly to all plots as necessary. *Foliar fertilizer applications described in the above table were applied twice, initial bulb swell and approximately 30 days prior to lifting. Ten days prior to the actual harvest, all bulbs were lifted and placed back in the plots to allow the tops and roots to dry. On October 10th, all the marketable sized onions were hand topped and collected from each plot. Over the next few days the harvested onions were hand sorted by size and each grade category weighted to determine yields.

Trt.		Yield	Lb Nutr.	NUE [#]
1	Conventional-Dry	7.00	453.6	3.1
2	ACLF-Band/SD	7.98	157.7	10.1
3	ACLF 50:50 surf/Band	8.80	157.7	11.2
4	ACLF w/ PTS	11.43	160.5	14.2
5	ACLF w/ G-07 Foliar	13.50	159.4	16.9
6	ACLF w/ F-07 Foliar	14.03	168.4	16.7
7	Carbo +M-500 Foliar	13.96	159.4	17.5
8	20-20-20 Foliar	8.94	163.7	10.9

#Nutrient Use Efficiency – (Lb. Yield / Total Lb. Nutrient as Fertilizer Applied)



*See *Product Descriptions* in the introduction for more information on ACLF products used.